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Original Research

Eating habits and physical activity of Saudi women before and during the COVID-19 pandemic

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Abstract

Background: During the COVID-19 pandemic, the lives of many people have been affected, and their lifestyles changed, including their eating habits and levels of physical activity.

Objective: This study aimed to assess lifestyle changes among Saudi women before and during the COVID-19 pandemic.

Methods: The study used a cross-sectional descriptive design. Participants were recruited via social media (WhatsApp, Twitter, and Facebook), and the data were collected in March 2021 through Godin–Shephard Leisure-Time Physical Activity questionnaire and eating habits questionnaire. Chi-square and *t*-tests were used for data analysis.

Results: The number of participants included in the analysis was 979. The results of the study showed no statistically significant difference in the BMI ($t = 1.29$, $p = 0.15$) or physical activity ($t = 1.49$, $p = 0.135$) when comparing the time before and during the pandemic. However, there were changes in their eating habits, including changes in the relative frequency of eating home-cooked meals and

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ordering from restaurants. Ordering restaurant meals per week decreased from 78.2% before COVID-19 to 47.5% during the pandemic. Moreover, there was a marked increase in anxiety reported about food hygiene from outside sources, from 14.7% before COVID-19 to 63% during the pandemic. Regarding physical activity, 41.7% said the pandemic had moderately affected their physical activity. The home was the most common setting for exercise both before and during the pandemic, but the percentage of participants exercising exclusively at home was almost doubled during the pandemic, from 46% before the pandemic to 81% during the pandemic

Conclusion: Dietary habits have changed in a good way during the pandemic; participants increased their consumption of home-cooked meals rather than eating restaurant meals. Also, the participants were more anxious about food hygiene during the COVID-19 pandemic.

Keywords

COVID-19; women lifestyle; dietary habits; eating behavior; physical activity; pandemic

Background

COVID-19 is a virus that affects the systems of the body, especially the respiratory system, and was identified by the World Health Organization (WHO) in February 2020 (World Health Organization, 2020). COVID-19 symptoms include fever, dry cough, fatigue, loss of taste and smell, a sore throat, shortness of breath, acute respiratory distress syndrome, and, in severe cases, death. The virus is transmitted via droplets through the air and contact and can be transmitted from animals to humans (World Health Organization, 2020).

The total number of confirmed cases in Saudi Arabia is approximately 778,398, and the total number of confirmed cases globally is approximately 541,044,314 (Saudi Center for Disease Prevention and Control, 2020). Many people's lives were affected during the pandemic, and their lifestyles changed (Chopra et al., 2020). For the purposes of this paper, "lifestyle" comprises two main components: eating habits and physical activity. Eating habits are defined as the type, quality, and quantity of food a person eats and how they prepare, store, and use food (LaCaille, 2013). Physical activity is defined by World Health Organization (2022) as "any bodily movement produced by skeletal muscles that require energy expenditure."

Several studies have shown changes in people's eating habits during the COVID-19 pandemic. One of these studies was conducted in Riyadh, Saudi Arabia (Alhusseini & Alqahtani, 2020); the results indicated the majority of adults

(85.6%) changed their eating habits by cooking and eating more frequently at home. It also showed the frequency of meals eaten outside the home decreased to 0 per week for 74.7% of people during the COVID-19 pandemic. In addition, online grocery shopping increased by 28.6% during the pandemic, and respondents reported a significant increase in anxiety about the hygiene of food from outside the home from 17.3% before the pandemic to 72.9% during it (Alhusseini & Alqahtani, 2020).

Another study conducted in the United Arab Emirates (UAE) had similar results; a large percentage of adults, about 96.2%, began to eat home-cooked food during the pandemic, while the rate of people who ate fast food decreased significantly. This study showed the consumption of five or more meals per day increased from 2.1% before COVID-19 to 7% during the pandemic. In addition, the rate of eating breakfast increased from 66% before the pandemic to 74.2% during it. The study also showed the percentage of those who drank eight or more glasses of water increased from 24.1% to 27.8% during the pandemic. Additionally, the percentage of people who engaged in physical activity for more than 5 hours a day increased from 32% before COVID-19 to 47.6% during it (Cheikh Ismail et al., 2020).

A third study in Kuwait reported that about 42.7% of its participants prepared their meals by themselves (AlMughamis et al., 2020). Also, a significant number of participants reported their weight would be the same after the COVID-19 pandemic, whereas 41.6% said it would increase (AlMughamis et al., 2020). Bakhsh et al. (2021) had similar findings: 45% of participants changed their eating habits and increased their food and snack intake, leading to a weight increase of 38%. A study in Palestine had similar results: 41.7% of the participants gained weight during the pandemic, and 50% increased their food consumption (Allabadi et al., 2020). Another study conducted in Zimbabwe found that 44.5% of participants reported an increase in body weight, 24.3% lost weight, and 31.2% had no change (Matsungo & Chopera, 2020). A study in Italy confirmed this was a worldwide trend; 48.6% of its samples noticed an increase in weight (Di Renzo et al., 2020). However, a study conducted on the Kurdish population of Iraq reported that only 29.3% of the participants had an increased appetite, 14.3% had a decreased appetite, and the majority (56.4%) had no change in their appetite level (Galali, 2021).

With regard to physical activity, most of the studies reported decreased physical activity during the pandemic. For example, Bakhsh et al. (2021) reported that the COVID-19 pandemic negatively affected physical activity levels and found a decrease of 52% in the level of physical activity during the pandemic. The same was held in Kuwait, where Cheikh Ismail et al. (2020) found that 69% of participants reported decreased physical activity. In addition, Galali (2021)

reported the same findings in Iraq, while the cohort in a study by Matsungo and Chopera (2020) reported a decrease in their physical activity level of 62.5%.

As to the frequency of physical activity, a study conducted in Saudi Arabia revealed that before the COVID-19 pandemic, most of the participants exercised at least three times per week; after the pandemic, however, 41.3% of participants were not exercising at all (Al-Shahry et al., 2020). Allabadi et al. (2020) found similar results: 45% of the participants had not engaged in any physical activity, such as walking, running, or exercising at home, and 29.5% reported they engaged in physical activity from one to three times per week. Consequently, 21.8% of the participants said their physical activity had increased.

The abovementioned studies, however, were not focused specifically on physical activity or eating habits among women. To fill that gap, our study aimed to assess Saudi women's lifestyle changes before and during the COVID-19 pandemic. This study will help researchers to understand whether changes occurred in women's lifestyles and eating habits during the COVID-19 pandemic. This study addressed two questions: 1) Is there a difference in eating habits among Saudi women before and during the COVID-19 pandemic? 2) Is there a difference in physical activity levels before and during the COVID-19 pandemic among women in Saudi Arabia?

Methods

Study Design

A descriptive correlational cross-sectional design was used.

Samples/Participants

The total suggested sample size was based on the G power for the *t*-test, with a small effect size of 0.2, alpha α 0.05, and beta β 0.95 327. To compensate for the possible missing data, we targeted a sample size of 1000 participants. The inclusion criteria for the study included: Women who were (1) not pregnant; (2) aged 18 years and older; (3) residents of Saudi Arabia; (4) free from mental or physical issues that might interfere with eating or physical activity, such as anorexia, bulimia, physical disability, heart disease, or kidney disease; and (5) Arabic speakers. We used convenience and snowballing sampling to recruit the participants.

Instruments

The survey used in the study contained two parts:

Part 1 consisted of 10 items and gathered demographic characteristics: (1) age, (2) marital status, (3) level of education, (4) location, (5) weight before and during

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COVID-19 (open question), (6) height (open question), (7) chronic medical conditions, (8) employment status before and during COVID-19, (9) family income, and (10) whether they had been diagnosed with COVID-19.

Part 2 contains two sections: Section 1 includes questions about eating habits during the pandemic that were based on those from Alhusseini and Alqahtani (2020). Section 2 investigates physical activity during the pandemic, using the Godin–Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ) (Godin & Shephard, 1985). To use the questionnaire with Arabic-speaking participants, we used the translation and back-translation methods for all the surveys. In addition, a pilot study was conducted to measure the reliability of the GSLTPAQ. Also, both questionnaires were accessible for public use.

Eating Habits Questions. This section—the second section of Part 2—comprises four questions: an open-ended response about the participants' opinions about their habits for eating healthy foods; the frequency at which they ate home-cooked meals during the week; the frequency at which they ordered meals from restaurants per week; and an open-ended response about participants' feelings when they bought food from markets, online, or in restaurants (Alhusseini & Alqahtani, 2020).

Physical Activity Questionnaire. The Godin–Shephard Leisure-Time Physical Activity Questionnaire helps to measure leisure-time physical activity (LTPA) (Godin & Shephard, 1985). The test-retest reliability agreement for the English version was 72%, and the scale showed good convergent and divergent validity (Godin & Shephard, 1985). Based on the results of the pilot study, the reliability for the Arabic version of the scale showed very good reliability, with Cronbach's alpha = 0.75. The scoring system for the scales ranges from 0 to 24 points. The interpretation of the scores broke down as follows: less than 14 points, sedentary; 14–23, moderately active; 24 points or more, highly active (Godin & Shephard, 1985).

Data Collection

The data were collected in March 2021. The samples were reached via social media, which included Twitter, Facebook, WhatsApp, and Snapchat. A flyer was posted on the social media webpages of the researchers, which outlined the aim of the study and included a time estimate of how long it would take participants to complete the survey. In addition, a link to an online (created using Google Forms) was included in the research ads. When participants clicked the link, they were guided to the inclusion questions; if they met the criteria, they were then directed to the consent form and finally to the survey questions.

Data Analysis

The data were analyzed using Statistical Package for Social Science (SPSS), version 23. The variables were divided into categorical variables and continuous variables. Categorical variables, according to characteristic and response, were given as frequency and percentage. Continuous variables were reported as mean, standard deviation, and interquartile range according to the distribution; a t-test was performed to compare the values before and during the COVID-19 pandemic that affected women's lifestyles in Saudi Arabia. The chi-square test was used to check the difference in the impacts of COVID-19 pandemic factors on women's lifestyles in Saudi Arabia across demographic variables.

Ethical Considerations

Ethical approval was obtained from the nursing faculty at King Abdulaziz University (NREC Serial No: Ref No2B56). Consent was obtained electronically by asking the participants if they would participate in the study. Participants' personal information was kept confidential and protected; only the research team could access the data. Also, it was mentioned that there was no harm imposed on participants, and they had the right to withdraw from the study at any time if they wished, particularly before the data were analyzed.

Results

The total number of participants who entered the survey was 1100. Of these, 1034 participants met the inclusion criteria. The number of participants who signed the consent was 1012, but only 1002 completed the survey. After removing the missing data, the number of participants included in the analysis was 979.

The demographic details are shown in Table 1. Most participants were between 18–28 years old (45.9%). More than half were married (51.1%), while 44.4% were single. In addition, most participants (63.3%) had a bachelor's degree. Most participants were from the western region of Saudi Arabia (80.7%). The majority of the participants (86.4%) did not have any chronic conditions, and 84.7% had not contracted COVID-19 at the time of data collection.

Physical Activity and Body Mass Index

Regarding the information about the difference in body mass index (BMI) and weight for the participants before and after the pandemic, we found no statistical significance in the difference in BMI. Also, there was no significant difference in physical activity between the period during and before the pandemic. The results are presented in Table 2.

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Table 1 Descriptive result for demographic characteristics

Demographics	Data	Frequency	%
Age	18–28 years	449	45.9%
	29–39 year	211	21.6%
	40 years and above	319	32.6%
Marital status	Single	435	44.4%
	Married	500	51.1%
	Widow	9	0.9%
	Divorce	35	3.6%
Level of education	Elementary school	7	0.7%
	Middle School	18	1.8%
	High School	214	21.9%
	Bachelor's Degree	620	63.3%
	Diploma degree	41	4.2%
	Master's Degree	51	5.2%
	Ph.D	28	2.9%
Place of residence in Saudi Arabia	Western Region	790	80.7%
	Southern area	45	4.6%
	Northern region	25	2.6%
	Central Region	82	8.4%
	Eastern Region	37	3.8%
Have any chronic medical conditions	Yes	133	13.6%
	No	846	86.4%
Employment status (Before COVID-19)	Employee	218	22.3%
	Not employee	379	38.7%
	Student	382	39%
Employment status (During COVID-19)	No change	747	76.3%
	Reduced hours	27	2.8%
	Increase hours	18	1.8%
	Distance working	163	16.6%
	Laid off	24	2.5%
Family income	Less than 5000 SR	212	21.7%
	5001–10000 SR	322	32.9%
	10001–15000 SR	192	19.6%
	More than 15000 SR	253	25.8%
Diagnosed with COVID-19	Yes	150	15.3%
	No	829	84.7%

Table 2 Comparison of values before and during COVID-19 pandemics affecting women's lifestyle in Saudi Arabia

	Mean	SD	Std. Error Mean	*t*	Sig. (2-tailed)
BMI (Before COVID-19)	25.8	6.3	0.2	1.29	0.15
BMI (During COVID-19)	26.0	6.4	0.2		
Exercise (Before COVID-19)	29.3	26.6	0.8	1.49	0.135
Exercise (During COVID-19)	28.6	27.3	1.0		

*p >0.05

Though the t-test showed no statistically significant difference in physical activity, the GSLTPAQ indicated a slight difference in the levels of physical activity among the participants. Before the pandemic, 25.5% of the participants reported light physical activity, 20.1% had moderate activity, and the majority—54.4%—had strenuous physical activity. However, during the pandemic, the percentage of participants who participated in light activity increased (27.2%),

while strenuous activity decreased (51.6%); moderate activity showed a very small rise to 21.2%.

In addition, we asked the participants about their perception of whether their physical activity had been affected by the pandemic. A plurality (n = 418, 41.7%) reported that their physical activity had been moderately affected by the pandemic, while a large minority (n = 319, 39%) reported that their physical activity had not been noticeably affected. The home was the most common setting for exercise both before and during the pandemic, but the percentage of participants exercising exclusively at home was almost doubled during the pandemic, from 46% before the pandemic (n = 461) to 81% during the pandemic (n = 816). There was a big decrease in the number of participants who used the gym before the pandemic (n = 184, 25%) and during the pandemic (n = 26, 2.6%).

Eating Habits

We asked the participants about their perceptions of their eating behavior before and during the pandemic, the frequency with which they ate home-cooked meals and meals from restaurants, and their anxiety level when buying food from restaurants. Table 3 compares dietary habits before and during the COVID-19 pandemic.

Table 3 Comparison of dietary habits before and during COVID-19

Dietary Habits	Data	Before COVID-19		During COVID-19	
		n	%	*n*	%
In your opinion, how would you rate your overall habits of eating healthy foods?	Poor	171	17.5%	236	24.1%
	Good	488	49.8%	326	33.3%
	Very good	260	26.6%	296	30.2%
	Excellent	60	6.1%	121	12.4%
How many times per week do you eat home-cooked meals?	None	10	1%	11	1.1%
	1–3 times/week	244	24.9%	120	12.3%
	4–6 times/week	368	37.6%	250	25.5%
	Daily	357	36.5%	598	61.1%
How many times per week do you order from a restaurant?	None	98	10%	417	42.6%
	1–3 times/week	766	78.2%	465	47.5%
	4–6 times/week	90	9.2%	78	8%
	Daily	25	2.6%	19	1.9%
When you buy food from markets, online, or restaurants, do you feel anxiety about food hygiene?	No	536	54.8%	104	10.6%
	Sometimes	299	30.5%	258	26.4%
	Yes	144	14.7%	617	63%

Only 6% reported excellent consumption of healthy food before the pandemic; that percentage doubled to 12% during the pandemic. However, the majority of participants said good consumption of healthy food both before and during the COVID-19 pandemic. A majority (61.1%) reported regularly eating home-cooked meals during COVID-19, compared with 36.5% beforehand.

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In addition, ordering restaurant meals 1–3 times per week decreased from 78.2% before COVID-19 to 47.5% during the pandemic. Moreover, there was a marked increase in anxiety reported about food hygiene from outside sources, from 14.7% before COVID-19 to 63% during the pandemic.

Discussion

Our research aimed to assess the eating habits and Saudi Arabian women's physical activity status before and during the pandemic. The sample comprised respondents from different regions of Saudi Arabia; our sample size included in the analysis (N = 979) was mostly from the western part of Saudi Arabia (80.7%). Our study is the first of its kind, wherein the majority of the sample was from Western Saudi Arabia and focused on only women. Alhusseini and Alqahtani (2020) conducted a study focused on the COVID-19 pandemic's effects on only the eating habits of women and men in Riyadh. Bakhsh et al. (2021) also conducted a study to evaluate whether the dietary and physical activity behaviors of Saudi populations, both male and female, changed during the COVID-19 pandemic. The sample size for both of those studies was more than 2,000 participants; a possible reason for the larger size compared to our study is the inclusion of both sexes in the sample (Alhusseini & Alqahtani, 2020; Bakhsh et al., 2021).

As for demographics, the majority of the study participants (46%) were between 18–28 years old, similar to the samples in Alhusseini and Alqahtani (2020). Also, the majority (51%) of participants were married, similar to Bakhsh et al. (2021), in which 71% of the participants were married.

In terms of changes in body weight between the period during COVID and before, we found no significant differences. This result differs from Bakhsh et al. (2021) because they reported that 38% of their participants gained weight. Di Renzo et al. (2020), conducted in Italy, studied BMI and food quality during the COVID-19 pandemic; they found a decrease in the BMI of 15% in participants who tended to eat healthy food from farms, such as vegetables and fresh fruits. The difference between our findings and those of other studies can be explained because the participants in our study reported no statistically significant difference in their physical activity level based on the Godin scale results. By contrast, in Bakhsh et al. (2021), 52% of the participants reported a decrease in their physical activity. Another study in the UAE reported that participants' physical activity levels increased from 32.1% before the COVID-19 pandemic to 38.5% during it (Cheikh Ismail et al., 2020).

Moreover, our results showed participants' physical activity levels had changed during the pandemic. We found the level of light physical activity

increased, and strenuous physical activity decreased compared to the period before the pandemic. This can be explained by the change in the setting for exercise. Most of the participants reported they did all their exercising at home during the pandemic, which might explain the lighter physical activity; the percentage of participants who used a gym decreased from 25% before COVID to just 2.6% during the pandemic, which may account for the decrease in strenuous activity. During the COVID-19 pandemic, there were many restrictions on gym use in Saudi Arabia, including vaccination requirements, decreased capacity, and a required-reservation system (Public Health Authority, 2022). All these restrictions limited the number of customers who could go to the gym for exercise; consequently, many preferred to exercise at home. Other studies, though, had contrasting findings. AlMughamis et al. (2020), for instance, found that 69% of study participants reported a decrease in their level of physical activity from before the pandemic, with 9.56% reporting an increase in time spent being sedentary at home. Al-Shahry et al. (2020) conducted a study exploring physical activity in Saudi Arabia and found that 41.3% of the participants exercised three times a day before the pandemic, but none exercised at all during the pandemic. This study also showed that 30.4% were not interested in walking before the pandemic; however, 32.6% took 5,000 steps each day before the pandemic but became uninterested in walking during it (Al-Shahry et al., 2020).

For the eating habits variable result, statistical analysis showed a change in eating habits; the percentage of participants who rated their own healthy eating habits as excellent doubled from the period before to during the pandemic. However, this percentage was still lower than that of participants who perceived their healthy eating habits as being good, which decreased from almost 50% before the pandemic to 33% during it. Our finding is slightly different than those reported in other studies, which found no difference in the consumption of healthy food during the pandemic (Alhusseini & Alqahtani, 2020; Bakhsh et al., 2021).

Another finding in our study was that the majority (61.1%) of participants reported eating home-cooked meals daily during the COVID-19 pandemic compared with 36.5% beforehand. As for those who ordered restaurant food one to three times per week, the percentage decreased from 78.2% to 47.5% during the pandemic. Our findings are similar to those of Alhusseini and Alqahtani (2020), who found the number of participants who ate home-cooked meals daily more than doubled during the pandemic, and most participants reported eating home-cooked meals daily during the pandemic (85.6%) compared with 35.6% before it. We also found similarities between our results and those of Cheikh Ismail et al. (2020), which was conducted in the UAE and showed an increase in

the consumption of food prepared at home (96.2%) during the pandemic compared with (82.8%) before it. Also, in terms of restaurant food consumption, the results showed a significant decrease, from 28.6% before the pandemic to 5.7% during it (Cheikh Ismail et al., 2020), and these findings are similar to our study results. The possible explanation for the increase in the amount of home-cooked food may be the fear of food contamination that prevented people from eating at restaurants during the pandemic. In our study, participants reported their anxiety about the level of hygiene of food from restaurants increased by nearly fivefold during the pandemic. These results are similar to another study that reported that 17% of participants expressed anxiety about food hygiene before the pandemic, but 73% of them expressed anxiety about it during the pandemic (Bakhsh et al., 2021).

Limitations of the Study and Recommendations for Future Studies

One limitation of this study was the data collection method. The online survey method we conveniently chose because of the implementation of social distancing during the COVID-19 pandemic may have caused us to reach only people with internet access for inclusion in the study. Also, the majority of the participants were from a single region in Saudi Arabia, which may limit the generalizability of the results. Furthermore, this was a cross-sectional study, so that no cause-and-effect relationship can be inferred. There was also no detailed information about food types or the amount of food intake.

We recommend collecting data from a larger, heterogeneous sample for future research. Future mixed-methods research may be used to develop a program that helps women make healthy adjustments to their lifestyles during public health crises and other national emergencies.

Implications of this Study to Healthcare Practice and Policy

Our results indicate that during the pandemic, eating habits improved thanks to decreasing consumption of food cooked outside the home, especially fast food. Also, exercise frequency was higher than before the pandemic, particularly at home. However, despite food consumption and exercise improvements, the participants' BMI increased during the pandemic. Two possible reasons for this could be a higher amount of food consumption and caloric intake or the type of exercise participants performed. To combat this, the healthcare system may increase awareness of the appropriate method for calculating caloric intake and healthy cooking methods to help people understand that consuming home-cooked food without being aware of the portion may increase weight and be unhealthy. Also, the healthcare system should focus on developing exercise

applications that help community members perform necessary exercises at home correctly. These applications will help community members adhere to exercise routines because they will be available anytime and anywhere.

Conclusion

Based on the questionnaire results, dietary habits have changed in a good way during the pandemic; participants increased their consumption of home-cooked meals rather than eating restaurant meals, considering eating at home both healthier and a protective measure during the pandemic period. Also, the participants were more anxious about food hygiene during the COVID-19 pandemic. Furthermore, the physical activity score indicates that the participants' exercise level increased overall during the COVID-19 pandemic period compared to before. However, despite the increase in the number of participants who did exercise during the COVID-19 pandemic period and the increased consumption of home-cooked meals during the COVID-19 pandemic period, the participants' mean weight and BMI increased during the COVID-19 pandemic. Given the apparent results, the participants mainly exercised at home rather than in public places because they were anxious about becoming infected, applying protective measures, maintaining social distancing, and reducing their visits to public places during the COVID-19 pandemic.

Declaration of Conflicting Interest
The authors declare no conflict of interest.

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Authors' Contributions
All authors equally substantially contributed to the work design, acquisition, analysis, and interpretation of the data; drafting or revising it critically for important intellectual content; final approval of the version to be published; and agreement to be accountable for all aspects of the work.

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Data Availability Statement
The data are available from the authors on request.

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